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EFFECT OF HYDROGEN PEROXIDE ON GERMINATION IN THREE WESTERN CONIFERS

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Seeds of western larch (Larix occidentalis), Douglas-fir (Pseudotsuga menziesii var. glauca), and subalpine fir (Abies lasiocarpa) germinate very slowly in standard germination tests without pretreatment. Germination may continue for 4 months or longer under usual conditions. A simple technique using hydrogen peroxide (H_2O_2) instead of water as the wetting agent during a germination test hastens germination and shortens the test period. The technique is somewhat similar to methods used in treating seeds of certain cereal crops, legumes, and vegetables.

Seed for the test for each species were collected from mature and overmature trees in two locations. Collections were made on the Flathead National Forest in northwestern Montana late in the summer of 1958. The cones were stored in cloth bags at room temperature. Western larch and Douglas-fir seed were extracted in a cone shaker, and subalpine fir seed were separated from the cone scales by sifting through 3/8-inch hardware cloth. No seeds were purposely dewinged. Extracted seeds were stored at room temperature for 4 weeks before testing started.

METHODS

Eight individual lots of 100 seeds were randomly chosen from each seed source. All lots were treated with "Ceresan," a commercial seed disinfectant, and then arranged on blotting paper in separate petri dishes. The treatments consisted of moistening four lots from each species source with water (control) and the other four lots with a U.S.P. 3-percent solution of hydrogen peroxide. The seed lots from each species were arranged in a 4 X 4 latin square with both sources and both treatments represented in all rows and columns.

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Throughout the test, seeds were kept moist with either H_2O or H_2O_2 according to the assigned treatments.

The test was run in a greenhouse without rigid environmental controls. Temperatures ranged from 36°F. to 110°F.; 64°F. and 88°F. were the average minimum and maximum, respectively. Shade panels placed over the test area prevented the petri dishes from receiving direct sunlight.

Germination was counted daily for the first 3 weeks, then at 2- or 3-day intervals until the end of the experiment. The criterion for germination was a radical emergence of 1 mm. Abnormal germination was less than 1 percent and was excluded from the analysis.

RESULTS

Western Larch and Douglas-Fir

Larch and Douglas-fir seeds moistened with H_2O_2 germinated significantly faster than seeds wetted with H_2O (fig. 1). Germinative energy of the H_2O_2-treated seeds was evident about 14 days after the start of the experiment, whereas 50 to 90 days were necessary for the control seeds to attain equal germination.

After 129 days, the peroxide-moistened seeds from three of the four sources showed greater germinative capacity than the control. Significant differences in average germinative capacity between the two sources of larch were evident, but no significant difference between the Douglas-fir source was apparent. The larch seed from the Felix Creek source treated with H_2O_2 had significantly more germination at the end of the test than the control. None of the seed from the other sources differed significantly from the controls at the end of the experiment. After 20 days, germination was 78 to 98 percent completed in the dishes containing H_2O_2-treated seed, but was less than 6 percent finished in the control dishes.

Subalpine Fir

Subalpine fir seeds did not respond as readily to H_2O_2 treatment as did larch and Douglas-fir seeds. There was no significant difference between treatments at any time. However, germination of the H_2O_2-treated seeds gradually accelerated. Germination of the H_2O-treated seeds exceeded that of the H_2O_2-treated seeds at 75 and 95 days. Peak germination of the H_2O_2-treated seeds probably occurred at 30 days, but 70 to 80 days were needed for the H_2O-moistened seeds to reach the same point. Possibly a 3-percent concentration of H_2O_2 is too great for response, because water-treated seeds showed more final germination.

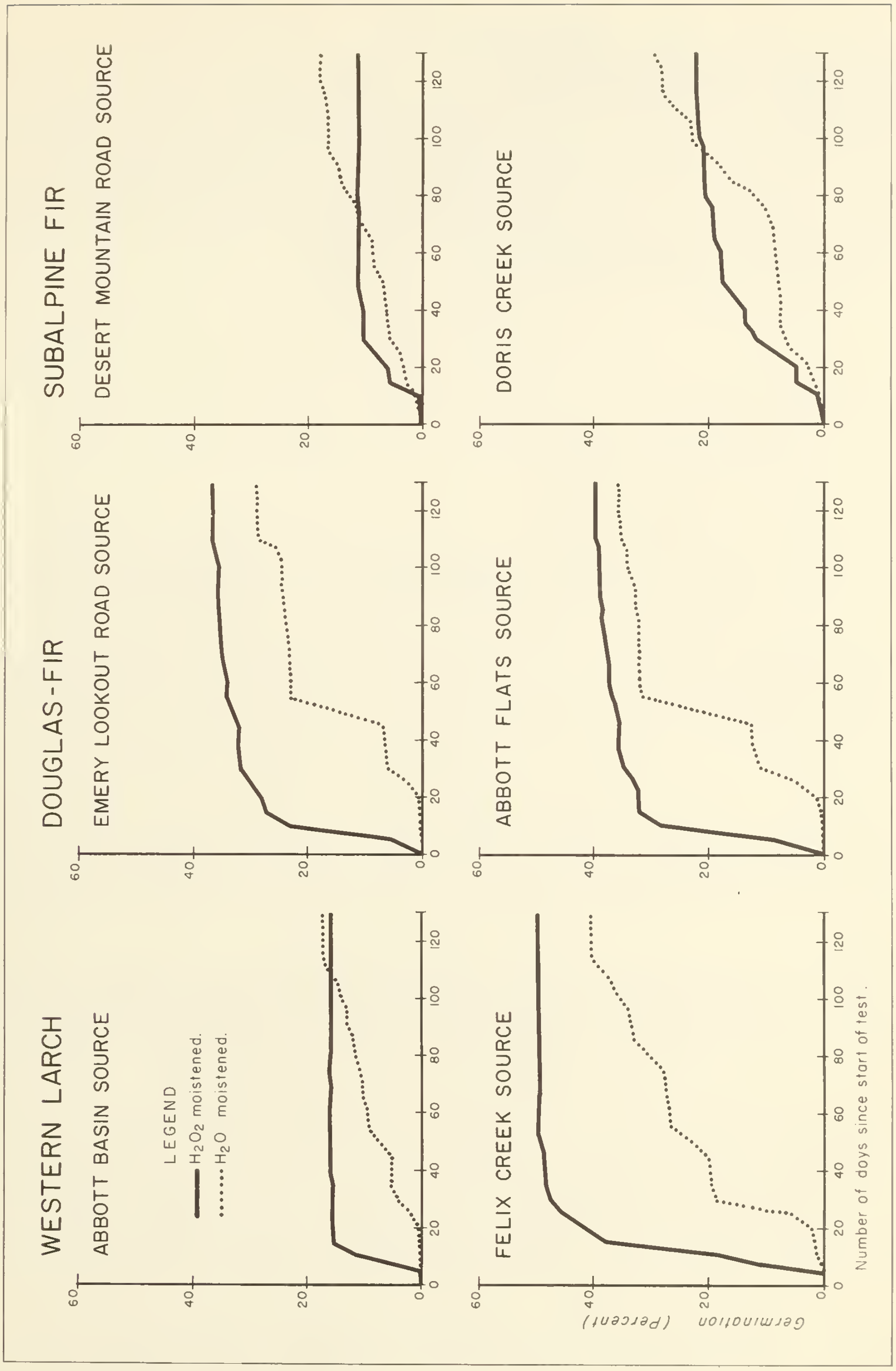

Figure 1.--Average germination of western larch, Douglas-fir, and subalpine fir seeds moistened with H_2O_2 and H_2O.

CONCLUSION

Because moistening with H_2O_2 greatly speeds and may increase total germination of western larch and Douglas-fir seed, it can be recommended as a desirable method for use in testing seed of these species. Since subalpine fir seed did not respond as favorably to this particular peroxide treatment as Douglas-fir and larch seed, additional tests of this method are needed to show what concentration of H_2O_2 serves best and what length of soaking period is most effective.